

What is claimed is:

1 1. A method for determining a three-dimensional
2 surface profile of an object comprising a plurality of
3 object points, the method comprising:

4 (a) providing a grating projector to direct an incident
5 beam of light having a pattern at the object;

6 (b) receipt and storage of a resultantly formed grating
7 image of a line profile of the object by a multi-
8 line photoelectric image device;

9 (c) shifting the object opposite to a phase shifter,
10 wherein the grating projector and the multi-line
11 photoelectric image device are taken together to
12 form the phase shifter;

13 (d) repeating steps (a) to (c) until all object points
14 are imaged on the multi-line photoelectric image
15 device; and

16 (e) determining a phase of each object point, and
17 transforming and rectifying the phase to a height
18 by an appropriate trigonometric algorithm to be
19 viewed on a display device.

1 2. The method of claim 1, further comprising, before
2 step (e), rectifying optical vignetting and uniformly
3 rectifying different pixel responses for the multi-line
4 photoelectric image device.

1 3. The method of claim 1 wherein shifting the object
2 opposite to a phase shifter is a relative motion between the
3 object and the phase shifter.

1 4. The method of claim 1 wherein the pattern is a
2 striped sinusoidally varying intensity pattern, a
3 sinusoidally varying intensity pattern, or a pattern made by
4 the Moire method.

1 5. The method of claim 1 wherein the multi-line
2 photoelectric image device is arranged by a plurality of CCD
3 elements, CMOSs or photo diodes.

1 6. The method of claim 1 wherein the multi-line
2 photoelectric image device comprises a plurality of
3 photoelectric elements arranged in an array structure.

1 7. A system for determining a three-dimensional
2 surface profile of an object comprising a plurality of
3 object points, the system comprising:

4 a phase shifter comprising:

5 at least one grating projector to direct an
6 incident beam of light having a pattern at
7 the object; and

8 a multi-line photoelectric image device;

9 wherein the relative position between one of the
10 grating projectors and the multi-line
11 photoelectric image device must be fixed,
12 and the object is shifted opposite to the
13 phase shifter to obtain a plurality of scan
14 images; and

15 a processor for determining a plurality of phases
16 according to the scan images, and transforming
17 the phases to the three-dimensional surface

18 profile of the object by an appropriate
19 trigonometric algorithm.

1 8. The system of claim 8, further comprising a
2 display coupled to the processor for displaying the three-
3 dimensional surface profile of the object.

1 9. The system of claim 8 wherein, for the multi-line
2 photoelectric image device, rectification procedures for
3 optical vignetting and uniformity for different pixel
4 response are performed in the processor.

1 10. The method of claim 8 wherein shifting the object
2 opposite to a phase shifter is a relative motion between the
3 object and the phase shifter.

1 11. The method of claim 8 wherein the pattern is a
2 striped sinusoidally varying intensity pattern, a
3 sinusoidally varying intensity pattern, or a pattern made by
4 the Moire method.

1 12. The method of claim 8 wherein the multi-line
2 photoelectric image device is arranged by a plurality of CCD
3 elements, CMOSs or photo diodes.

1 13. The system of claim 8 wherein the multi-line
2 photoelectric image device comprises a plurality of
3 photoelectric elements arranged in an array structure.